MONTHLY LETTER OF THE BUREAU OF ENTOMOLOGY
UNITED STATES DEPARTMENT OF AGRICULTURE

Number 228 | Activities for March (Not for Publication) | April, 1933

TRUCK CROP AND GARDEN INSECTS

Weather in relation to beet leafhopper populations.--Reporting on the meteorological factors useful in forecasting outbreaks of Eutettix tenellus Bak., J. C. Chamberlin and F. H. Harries, Twin Falls, Idaho, state that "the maximum temperatures of the preceding year, February to November inclusive, are by far the most influential factors in determining leafhopper populations the following year. This temperature factor is followed in importance by the winter precipitation in well-marked storm periods from November to February, inclusive, while the third most important factor is the precipitation during the 'critical' (as far as the uncultivated hosts of E. tenellus are concerned) period of September and October of the preceding fall. Properly weighted, these factors can be shown to account for all but about 8 percent of the variations in sugar-beet tonnages in the Twin Falls-Jerome area since the establishment of the industry (1916)."

Effect of weathering on fluorine residues on celery.--C. F. Stahl, Sanford, Fla., reports that "In cooperation with the Food and Drug Administration a field experiment was conducted to determine the effect of weathering and stripping at harvest time on fluorine residues on celery, using a natural cryolite compound, a barium fluosilicate compound, and a 30 percent sodium fluosilicate dust. Although 3.77 inches of rain fell after the first application, it is evident that none of these treatments could be permitted on the basis of the tolerance allowed for arsenical residues. Even the heavy rain after the single application, which weathered for 21 days, failed to reduce the residue sufficiently."

Wireworms lose weight in transformation.--C. E. Woodworth, Walla Walla, Wash., reports that "In the process of transformation (of Pheletes spp.) from larvae to adults there occurs a tremendous loss in weight. In a preliminary study of this phase of development it was found that about 25 percent of the prepupal weight is lost by the time of full coloration of the beetle. Only about one-fifth of this takes place in change from prepupa to pupa, regardless of the fact that a rather heavy prepupal skin is cast. About 20 percent is lost in the change from pupa to adult, even though the skin cast is extremely thin. The loss in the transformation from prepupa to pupa ranges from 4.4 percent to 6.5 percent. In the change from pupa to adult the loss ranges from 19 percent to 25 percent. The larger individuals tend to experience the larger percentage of loss."

Control of sand wireworm by starvation.--"Small-scale laboratory experiments," by J. N. Tenhet, Fairfax, S. C., "throw an interesting light upon the possibilities of control (of Horistonotus uhlerii Horn) by starvation: (1) Larvae kept in soil during the winter without food were practically all dead in two months; (2) larvae kept with an abundance of unsuitable food through the winter showed a very heavy mortality (even though signs of feeding upon the roots of the plants could be noted); (3) during the winter larvae were apparently able to survive a 30-day period without food; (4) larvae furnished with a plentiful supply of satisfactory food throughout the fall and winter have all come through the winter in good condition, with only extremely light loss in numbers."

FOREST INSECTS

Correction.--The specimens referred to in the January 1933 Monthly Letter (No. 225) p. 13, line 21, were not moths but newly hatched gipsy moth larvae.

Hybridization of Tachina species results in weakened progeny.--R. T. Webber, Melrose Highland, Mass., states concerning Tachina larvarum L. and Tachina mella Walk., that "an interesting phase is connected with experiments where larvarum males from Europe were confined with native mella females and larvarum females with mella males." Of the former 47 out of 75 pairs mated; 28 flies deposited a total of 446 eggs, of which 80 were fertile and 19 hatched. Of the latter only 3 out of 36 pairs mated; 3 flies laid a total of 36 eggs, none of which were fertile. Mr. Webber adds: "The results of these experiments show conclusively that hybridization, at least in the case of the American (mella) females, may very well occur and the imperfect fertilization of these individuals which do cross renders them unable to reproduce other than a few weakened progeny. Such being the case, it is probable that the least numerous species, in this case larvarum, would ultimately die out. * * * While hybridization of the species appears most detrimental to larvarum it is not to be regarded as the sole cause of its nonestablishment in New England. Other factors, such as a suitable host species for hibernation and the effects of competitors, are equally important."

Cooperative bark-beetle control.--Reporting on the campaign which has been in progress on various Federal and private projects since early last December, J. M. Miller, Berkeley, Calif., says: "Eradication work is now in full swing on eight projects within the State, involving the employment of something over 400 men. The responsibility of this laboratory has been limited mainly to the planning and direction of these projects * * * The two largest projects now under way are those within the Yosemite National Park and the Sierra National Forest, involving a total expenditure of $65,000. The areas that are being covered are situated in the yellow pine-sugar pine type. * * * Both the Yosemite National Park and The Sierra National Forest have developed highly effi-

cient control organizations, recruited largely from unemployed loggers from nearby lumbering operations that have closed down. It is expected that both jobs will be completed on schedule.

Control work reduces losses in Sierra National Forest.--"A recruise of Plot 7 on the Sierra Forest, which was covered by control work during the winter of 1931-32, was made during the month (March) by K. A. Salman with the assistance of P. C. Johnson, F. W. Bacon, R. L. Furniss, and E. F. Wohletz," reports J. M. Miller, Berkeley, Calif. "The tree losses for 1932, following control work, were found to be 64 percent less than those for 1931, preceding control. * * * It was found that very few aggressive western pine beetle broods were represented in the 1932 overwintering infestation, the greater number of the trees having been killed by flathead infestation which attacked trees previously topkilled. The following is an analysis of insect-caused losses on the plot for the past three years:

	Ponderosa pine				Sugar pine			
	Brood trees		Topkills		Brood trees		Topkills	
Year	Trees Number	Volume Cu. ft.	Trees Number	Volume Cu. ft.	Trees Number	Volume Cu. ft.	Trees Number	Volume Cu. ft.
1930	215	82,190	--	--	1	680	--	--
1931	572	493,500	494	480,780	4	10,340	2	1,050
1932	207	181,930	59	74,710	1	1,100	2	290

Of the 1931 topkills, 129 became 1932 brood trees. Six of the 1932 topkills cruised early in the season became 1932 brood trees of the late summer or winter broods. The figures given in the table show the great reduction in topkilling, which indicates reduction in activity of Ips that took place in 1932. Figures for topkills in 1930 are not available."

CEREAL AND FORAGE INSECTS

Ohio River floods may aid in dispersing corn borer.--D. J. Caffrey, Toledo, Ohio, reports that "in March floods along the upper reaches of the Ohio River and its tributaries reached much higher levels than during the past several seasons. It will be recalled that one explanation for the origin of some of the isolated Pyrausta nubilalis Hbn. infestations found closely adjacent to the Ohio River in Kentucky, southern Indiana, West Virginia, and southern Ohio, has been attributed to probable water carriage of infested corn residues. In 1920 it was demonstrated that 33 percent of the P. nubilalis larvae contained in cornstalks floating in water for 28 days in late February and early March, produced moths. A total of 3.6 percent produced moths from cornstalks floating in water for 36 days, from March 15 to April 21. A total of 1.1 percent produced moths after floating in water for 43 days, from March 9 to April 21. In 1926 additional field work by P A. Howell, of the

Bureau of Plant Quarantine, with tagged uninfested cornstalks and corn stubble, led to the recovery of such tagged corn residues at distances of 222, 185, 130, 98, 78, 45, 40, and 30 miles, per recovery, from the point of origin. In view of this known ability of hibernating P. nubilalis larvae to survive long periods of immersion in water, and the recorded long-distance water carriage of corn residues, the present flooded condition of the Ohio River and its tributaries, draining extensive corn borer infested territory, may constitute an important item of P. nubilalis long-distance dispersion in 1933."

Baling cornstalks kills corn borer.--M. Schlosberg, Toledo, reports conclusions based on data obtained from tests conducted by the Bureaus of Agricultural Economics and Entomology at Toledo in 1928-32. He states: "Normal baling pressures, approximating 18 to 20 pounds per square inch of bale, cross section, resulted in a mortality of 99 percent of the larvae (of P. nubilalis) in shredded material, and 96 percent and above in whole stalks. A mortality of 100 percent of the larvae was obtained in shredded material by baling pressures of about 26 pounds and in whole stalks by pressures of 35 pounds. The percentage of mortality was higher in the more heavily infested material as a result apparently of the weaker condition of the stalks. Apparently neither the size of the bale nor the moisture content of the stalks at the time of baling affects the percentage of mortality at given baling pressures, although subsequent drying of the bales apparently increases the percentage of mortality."

Rearing of parasites of range caterpillar--summary for 1932-33.--J. C. Frankenfeld, Tempe, Ariz., reports as follows: "A total of 1,613,870 eggs of Hemileuca oliviae Ckll. were parasitized by Anastatus semiflavidus Gahan during this month (March). Of this number 1,576,959 were placed in refrigeration to be colonized in New Mexico. The remainder, or 36,911, were used for stocking oviposition cages. This completes the rearing work for this season for parasites to be colonized in New Mexico. Approximately 4,544,544 host eggs were parasitized this season under controlled conditions. Of this number 3,653,378 are to be colonized during the coming spring and summer. The remainder, or 694,255, parasitized host eggs were used for stock during the rearing season, and 196,911 parasitized host eggs will be held over in refrigeration to be used for stock when new host eggs are available this fall."

Insect food of the armadillo in eastern Texas.--"Food analysis returns on five stomachs of the armadillo (Dasypus novemcinctum texanum Bailey) from this section sent last June to the Bureau of Biological Survey, Denver, Colo., has been received," reports A. I. Balzer, Beaumont, Tex. "The list of items found in the stomachs shows that 58.6 percent of the food consisted of insects. An additional 19.4 percent of Arthropoda other than insects were found. Although only one of the stomachs came from a community with known sugarcane beetle (Euetheola rugiceps Lec.) infestation, one such beetle was found in the series of stomachs."

Jointworm galls not caused by sting of adult.--F. F. Dicke, Charlottesville, Va., reports that "Practically the entire month (March) was devoted to a detailed study of the development of the wheat jointworm (Harmolita tritici Fitch) and the wheat sheath-gall jointworm (H. vaginicola Doane) galls * * * particular stress was given to whether or not gall development was induced by a growth-producing stimulus introduced by the female during the process of oviposition. * * * In all instances it was found that the tissues disturbed by the oviposition process healed very quickly. However, there result many irregularly shaped cells in the scar tissue with streaks of dead material between the cells throughout the tissues pierced by the ovipositor. No true gall tissue was found in any such plants, nor have we ever found a cavity which was to contain the egg. * * * In the culms normally infested with eggs there is further evidence against the 'introduced stimulus' theory. The presence of the egg causes a reaction in the affected tissues immediately after oviposition, which really results in the healing of the tissues lacerated by the ovipositor. * * * When the larva makes its appearance there, again, is a decided reaction in the plant tissues. * * * By the end of the first instar (when the larva is immotile and bathed in plant sap) there is quite a mass of such protoplasm-filled tissue surrounding the larva. In the second instar the plant sap does not flow quite so freely, but the larva develops a long pointed head segment which it uses to prod the surrounding plant tissue to induce sap flow. This prodding by the larva is the initial stimulus for the rapid development of gall tissue which follows. * * * Apparently this neoplasmic growth is composed of material produced from the by-products of larval metabolism. Its distribution in the tissues and the resultant gall development is caused by the continuous larval irritation starting with the second-instar larva."

COTTON INSECTS

Boll weevil survival in 1933 greatly reduced over 1932.--In connection with the following record, it will be recalled that the winter of 1932 was one of the mildest ever known, with corresponding small percentage of boll weevil mortality. An interesting contrast between the winter of 1932 and that of 1933 is indicated in the report of G. L. Smith, J. C. Clark, and A. L. Scales, of the Tallulah, La., laboratory. This year a total of 45 weevils were recorded as active in the 70 hibernation cages (35,000 weevils) in March, whereas 1,114 weevils were recorded in 70 similar cages in the same month a year ago. On the 20 flight screens in the fields only 9 weevils were collected in March, as compared to 223 in March 1932. In the hibernation cages, therefore, 4.039 percent as many weevils were noted in March this year as last year, while the flight screens collected 4.035 percent as many weevils as were collected on similar screens in March 1932.

Boll weevil survival in Spanish moss.--One of the methods of determining the winter survival of boll weevils for comparison with survival in previous years is to collect the hibernating weevils in Spanish moss

in the early spring and determine the number of live weevils per ton of moss. R. C. Gaines submits a brief summary of Spanish moss examinations for the past 6 years in Louisiana, South Carolina, Georgia, and Alabama. Outside the Tallalah section these examinations involved 6 points in Georgia, 5 in Alabama, 14 in northeastern Louisiana, and 9 in South Carolina:

	Six-year record of weevil survival per ton of moss					
Year	North-eastern Louisiana	Southern Louisiana	Louisiana	South Carolina	Georgia	Alabama
1928	1.0	365.1	65.9	21.1	88.7	45.2
1929	3.8	261.8	40.6	70.7	38.7	10.8
1930	0.2	7.1	0.9	26.9	0	4.2
1931	33.0	216.0	79.0	25.0	119.0	79.0
1932	462.3	364.5	444.4	105.3	219.2	107.4
1933	1.3	62.6	12.7	32.8	227.0	0

The minimum temperature and the number of days the temperature fell below 32° F. for each of the winter months in the last two seasons at Tallulah were as follows:

1931-32			1932-33		
	° F.	Days below 32° F.		° F.	Days below 32° F.
November	28	3	November	22	10
December	30	1	December	16	7
January	27	6	January	23	6
February	29	2	February	12	5
March	23	6	March	32	0

INSECTS AFFECTING MAN AND ANIMALS

Cayenne tick a pest at Brownsville, Tex.--H. O. Schroeder reports that "Amblyomma cajennense (Fab.) has continued to increase in number, particularly the last 30 days. This tick has a very wide host range and is at present the dominant species of tick occurring on livestock. It occurs in greatest abundance in brushy pastures and at times becomes so severe on cattle that some farmers spray their milk cows or give them arsenical baths as recommended for the American cattle tick. The species attaches to dogs very readily and sometimes in considerable numbers." It also attacks the human host, leaving, if attached for some time, a red itching welt which, however, does not persist as long as a similar welt produced by the lone star tick (A. americanum L.) Derris powder in the strength of 1 percent rotenone will kill the tick quite readily.

Light traps effective for catching sand flies.--According to W. E. Dove, Savannah, Ga., "The traps used on the headlights of automobiles are very effective in securing specimens (of sand flies), and it is thought that modifications to more practical designs may prove effective as a means of control. * * * When the sand flies come to the traps in large numbers, they form dances in front of the lights. Such dances

apparently consist of the sand flies which come from right angles to the direct rays of reflected light. Those entering the rays at distant points move quickly into the trap without any hesitation. Those entering from the side form dances and gradually follow the rays into the trap."

Punkies breed in holes in trees.---Mr. Dove also states that "At least two species of punkies are reared from rot holes of trees in this vicinity. We feel that such a habitat probably accounts for other punkies of unknown origin. * * * We suggest that defective trees bearing cavities be eliminated or treated so as to render them incapable of breeding these pests. We would emphasize that the good principles of tree surgery are effective in preventing the breeding of such midges. If it is not possible to remove decayed portions and fill cavities with concrete, the rot holes may be treated with an application of creosote oil or creosoted pine sap. One treatment lasts for an entire year. In searching for such breeding places, it is not necessary to examine pines. In the Southeastern States the punkies are found most commonly in gum and live oak trees."

Temperature of flooded soil affects hatching of mosquitoes.---C. M. Gjullin, Portland, Oreg., "has continued experiments on the temperature and moisture requirements of sod samples to produce larvae of Aedes aldrichi Dyar & Knab and A. vexans Meig. Results so far obtained indicate that eggs, if present, will hatch when flooded after the soil has been dried out and warmed and also when the soil is moist and warm, but that they will not hatch if the soil is flooded when it is moist and cold. Neither did such sods produce larvae if treated with warm water and allowed to stand at room temperatures for several days. * * * cold sods as brought in from the field are approximately 45° F., whereas the warm sods are those which have remained in the laboratory for a day or two and warmed to about 70° F. * * * in the field considerable hatching has been stimulated in flood water as low as 50° F. Practically all sods flooded when cold and wet produced larvae on second and subsequent floodings, i.e., after they had been dried to some extent and the temperature increased to about 70°. The tests also indicated that when soil temperatures were low (45°) the eggs would hatch from dry soil when flooded more quickly and in greater numbers than from moist soil. Egg beds in the field flooded by winter rains do not produce larvae. And, as far as we have been able to observe, do not produce larvae if the water continues to stand on them, although the temperature may later become sufficiently high. These same areas may produce larvae if they are dried up, raised to about 50° F., and later flooded by water at approximately that temperature. * * * a great many soil samples produced only a few A. aldrichi larvae to several hundred A. vexans. * * * We can make no explanation of this great difference in numbers * * * except to say that A. aldrichi is apparently more resistant to flooding and may require a longer incubation period, as the area mentioned had not been reached by high water for four years."

STORED PRODUCT INSECTS

Burning pea fields soon after harvest aids in weevil control.--A.O. Larson, Corvallis, Oreg., reports as follows on the value of burning stubble and threshed vines as a means of killing adult pea weevils (Bruchus pisorum L.): "On March 2 we examined approximately 300 fence posts about two pea fields at Hillsboro and Orenco. Only one pea weevil was found about one field and only four about the other. Both fields had been burned as soon after harvest as possible. Both fields were surrounded by woods so that plenty of nearby hibernating quarters were available, but apparently very few weevils had escaped."

Harvest loss in relation to pea weevil control.--Tom Brindley, Moscow, Idaho, summarizes a 2-years' study of harvest loss as compared with weevil infestation. He states: "This study was carried on in 1932 in the same manner as in 1931. Six plots 10 feet square were picked at random about each of the fields studied. Nineteen fields were examined, 12 of which were harvested by the combine; 5 were mowed and threshed by a stationary thresher; and 2 were harvested by miscellaneous methods. * * * The harvest loss for 1932 was much less than for 1931 * * * 9 fields were examined each year. In 1931, the average loss for these fields was 28 percent, and only 11 percent in 1932. * * * much of the loss is due to the way the peas are harvested, for the same farmers had the heaviest loss each year. The smaller loss in 1932 may be due to the greater length of the vines in that year. Some of the decrease in loss may also be due to the education of the farmers against loss. The decrease in harvest loss automatically decreased the number of weevils escaping from shattered peas. The average loss for 9 fields in 1931 was 477 pounds, and the average infestation was 28 percent, while in 1932 the average loss in the same 9 fields was 183 pounds per acre and the average infestation was 11 percent."

Relative abundance of Ephestia larvae overwintering under grapevine bark.--On March 3 D. F. Barnes and H. C. Donohoe, Fresno, Calif., completed examinations of the same 18 vineyards that were visited in 1932. "The average infestation by Ephestia spp. was 128 larvae per acre. In 1932 the population was 922 per acre and in 1931 113 per acre. * * * The above data show that Ephestia larvae under bark are present in about the same numbers this year as in 1931; however, in 8 vineyards out of 18 examined in 1933 no larvae were found, whereas in 1931 no larvae were found in 3 of the 16 vineyards examined, indicating a more uneven distribution of infestation in 1933. With our present knowledge it is not possible to predict what the developments will be, since weather conditions and prevalence of parasites later in the season appear to influence the damage done to figs and raisins by Ephestia figulilella Greg., the dominant species."

Life history of Nemeritis canescens Grav.--Mr. Donohoe reports that he has "completed the rearing from egg deposition to adult emer-

gence of 171 Nemeritis canescens Grav., on larvae of Ephestia figulilella Greg. and Plodia interpunctella Hbn. At a nearly constant temperature of 83.5° F., the parasites completed development in celluloid vials in 22.6 days in Plodia hosts and in 24.2 days in Ephestia hosts. At 82.3° F., in Ephestia larvae, the parasites developed in 23.5 days in glass vials and in 22.7 days in vials of celluloid. With rare exceptions Nemeritis canescens does not attack host larvae until the latter have entered crevices so constricted that they are unable to move or writhe about or until they have enclosed themselves in cocoons. Emergence of the adult parasite sometimes occurs from the pupa of the host. An average of 31 host larvae were killed by each female parent observed. Adult N. canescens emerged from about 48 percent of the host larvae killed by the female parents."

Critical temperature for cigarette beetle.--W. D. Reed, Richmond, Va., submits a summary of temperature experiments "in the refrigerator in March to determine the resistance of cigarette-beetle larvae to sudden changes in temperature. * * * It can be seen that a temperature below 20° F. is very critical to larvae of Lasioderma serricorne Fab. The relative humidity in the refrigerator ranged from 48 to 74 percent during the exposures."

TOXICOLOGY AND PHYSIOLOGY OF INSECTS

Rotenone mixture permanently cripples flies.--F. L. Campbell, Takoma Park, Md., reports that "preliminary comparisons (by himself and W. N. Sullivan) of the effect of the pyrethrins and rotenone in kerosene-cyclohexanone (9 to 1) showed that rotenone permanently cripples surviving flies, whereas the flies recovering from treatment with the pyrethrins appear to be normal in every respect. Because of uncertainty as to the concentration of the pyrethrins in the solutions that were tested a statement on the relative lethal action of the pyrethrins and rotenone cannot be made at this time."

A nicotine compound far more toxic to silkworms than is lead arsenate.--According to J. W. Bulger, Takoma Park, "Nicotine-bentonite containing 5 percent nicotine is about 4 times as toxic to silkworms as is lead arsenate, when calculated upon a gram-for-gram basis. If calculations were based upon the nicotine content only the difference would be about 20 times greater."

Diphenylene compounds toxic to Southern armyworm.--M. C. Swingle, Sanford, Fla., reports that "Ten different concentrations of diphenylene sulphide were tested on about 650 larvae of the Southern armyworm (Prodenia eridania Cram.). This substance acts more slowly than lead arsenate but over a period of 3 days the toxicity is not much less. Diphenylene oxide was also tested at 10 different concentrations on 520 larvae. It was not so toxic as the sulphide at the lower concentrations but was about equally so at high concentrations. Its toxicity seemed to be about two-thirds that of lead arsenate."

FRUIT AND SHADE TREE INSECTS

American plum borer on pecans controlled by paradichlorobenzene.--C. B. Nickels, in charge of pecan insect investigations, Brownwood, Tex., reports that "In the process of transforming native trees into improved varieties, the branches less than 4 inches in diameter are sawed off in the dormant season. The following season sprouts emerge from the trees and they are budded. The larva of Euzophera tunnels around the sprout near to the point of junction on to the tree. This results in weakened branches that are easily blown off by the wind. * * * 70 pecan trees (30 years old) were treated with a mixture consisting of 1 pound of paradichlorobenzene to 2 quarts of cottonseed oil. * * * applied with a paint brush on all areas which externally showed evidence of infestation. All of the trees were wormed 7 to 14 days after the application * * * All together 298 larvae were removed from the trees; 43 larvae were alive; 180 larvae were apparently killed by the insecticide; and 75 larvae (molded) apparently died from causes other than the application of the PDB mixture. Our records indicate that 80.7 percent of 223 normal larvae were killed as a result of the insecticidal treatment. We did not observe any injury to the trees * * * The vitality of the trees is at a low point for a period of 2 to 3 years after topping, but after that time the trees become more vigorous and are attacked by Euzophera semifuneralis Walk to only a slight extent.

Bark beetles invade roots of Monterey pine.--H. E. Burke, of the shade tree insect investigations, Palo Alto, Calif., reports that "Practically all of the roots of the Monterey pine pulled on the Stanford Campus in March had the inner bark riddled by the mines of the beetles or larvae of Dendroctonus valens Lec. Some roots showed evidence of infestation 9 feet from the stump. Some of the roots were 1 foot in diameter 6 feet from the stump. All of these observations indicate that in the Monterey pine in the San Francisco Bay region a large part of the brood of this insect develops underground, therefore no control can be successful unless the stumps and roots are treated, and whenever an improvement cutting is made in the planted groves the stumps and roots should be removed. Otherwise there is great danger of starting a beetle epidemic. In the past it has been the custom to pile the brush on the stumps and burn. This burned the bark off the stumps but did not touch the roots. Evidently the roots have been producing most of the beetles that have been reinfesting the groves."

Freezing points of three fruit insects.--E. H. Siegler and Francis Munger, Takoma Park, Md., have been determining the undercooling and freezing points of several fruit insects. Pupae of the grape berry moth (Polychrosis viteana Clemens) supplied by G. A. Runner, of the Sandusky, Ohio, laboratory, showed undercooling points ranging from -11.2° F. to -3.7° F., with freezing points ranging from 1.1° F. to 8.1° F. Messrs. Siegler and Munger also state, "that the codling moth (Carpocapsa pomonella L.) is able to survive the winter in our fruit-growing districts is almost entirely owing to its quiescent state as the temperature drops

below freezing. Below 32° F. the life processes are reduced to a minimum and no vibrations or movements sufficient to prevent a large undercooling occur while the larva lies dormant in its cell. We recently demonstrated the above by keeping the larvae in motion while attached to a thermocouple as the temperature was lowered. Instead of reaching a normal undercooling temperature of about -14° F., these moving larvae could be undercooled to only 15° F. and higher. * * * In tests this spring with overwintering larvae of the oriental fruit moth (Grapholitha molesta Busck), it was found that their resistance to low temperatures is about the same as that of the codling moth. The two species undercool and freeze at about the same temperatures."

San Jose scale not seriously injured by 12° F.--Oliver I. Snapp and J. R. Thomson, Jr., report that mortality counts of Aspidiotus perniciosus Comst. at Fort Valley, Ga., 5 days before and about 5 weeks after a minimum temperature of 12° F. on February 9 showed that the percentage of living scales was reduced from 92 to 75. This "indicates that unusually low temperatures in southern latitudes do not kill most of the San Jose scale on peach trees, although it is the consensus of opinion among many peach growers that a high percentage of scale is killed by very low temperatures, and some go so far as to omit the spray for scale if very cold weather occurs."

Winter mortality of camphor scale and dictyosperma scale in 1933.--A. W. Cressman and Mrs. L. T. Kessels, New Orleans, La., have submitted mortality records of Pseudaonidia duplex Ckll. These records are for the years 1924, 1926, 1928, and 1933, and are based on minimum temperatures ranging from 19° F. in 1924 to 23° F. in 1926. The mortality records are apparently not much influenced by minimum temperatures and range from 4 to 37 percent. For example, 30 to 37 percent mortality in 1933 with a minimum temperature of 20° F. may be contrasted with the 4 to 5 percent mortality in 1928 with the same minimum temperature. On the other hand they point out that in many places in New Orleans the dictyosperma scale (Chrysomphalus dictyospermi (Morgan)) was completely destroyed by the freeze of January 1924 and has been gradually increasing in that area since that time. Following the freeze in 1933 an examination of podocarpus leaves involving 2,247 scales showed that 96.4 percent were dead, including all the immature stages. The living adults were, however, reproducing on March 30, when the examination was made.

Mediterranean fruit flies emerging through considerable soil depths lack vitality.--Tai Hee Hong, of the Honolulu, Hawaii, laboratory, reports experiments in the burying of fruit fly pupae in loose soil at depths of 12, 18, 24, and 36 inches, employing 1,000 pupae to each depth. The emergence in percentages were respectively 87, 65.2, 50.2, and 26. The results indicate the necessity of burial in such loose soil more than 36 inches to insure 100 percent mortality. The following interesting statement is made on the vitality of flies emerging from these depths: "The greater the depth through which the flies have been subjected in coming to the surface successfully, the weaker and relatively more in-

active are the flies. Many cannot spread their wings and consequently are not able to fly, thus inducing death. Others, while seemingly active, die after two or more days, even though food is administered, and it seems only logical that the physiological efficiency of the flies has been greatly depleted owing to the strenuous effort exerted while attempting to come to the surface of the soil. The foregoing considerations are mainly applicable to flies subjected under 24 and 36 inches of soil."

Preliminary experiments with HCN treatments for control of adult tarnished plant bug.--E. J. Newcomer, Yakima, Wash., reports that "In cooperation with S. W. Griffin, of the Bureau of Chemistry and Soils, Wenatchee, Wash., some preliminary tests were made to learn whether or not fumigation experiments with insects could be carried on successfully with the apparatus Mr. Griffin has been using in smelter-fume investigations. It was found that this could be done, and several tests of HCN were made on adults of the tarnished plant bug. * * * It was evident from these tests that at a temperature of about 50° F. a gas concentration of 1,500 parts per million would require 10 minutes to kill all the bugs and a gas concentration of about 3,800 parts per million would require 5 minutes. This shows rather conclusively that momentary fumigation, such as might be obtained by dragging a closed container of some sort slowly over the ground and keeping it filled with gas, would not be successful. It is hoped that further work may be done to find out what results might be obtained by using calcium cyanide dust in such a container."

JAPANESE BEETLE AND ASIATIC BEETLE RESEARCH

Value of stomach poisons against immature stages of Jap beetle.--"The study of the effect of stomach poisons on the weight of the third-instar larvae of Popillia japonica Newm. was continued," by W. E. Fleming, F. E. Baker, and L. Koblitsky, Moorestown, N. J., "using groups of 100 individuals and weighing each larva daily on an analytical balance. Each experiment was continued until approximately half of the larvae had been killed by the treatment. The study has been completed this month (March) with the following stomach poisons: Calcium arsenate, barium arsenate, aluminum arsenate, ferric arsenate, zinc arsenate, and lead arsenate. * * * The larvae lost weight when placed in soil containing any of these arsenicals at the rate of 1,500 pounds per acre. * * * when a larva begins to feel the effect of the arsenic it ceases to take food into its body and the alimentary tract is gradually cleared of food, thus causing a definite loss of weight. The insecticidal results in other experiments have shown that barium and calcium arsenates, for example, are more toxic than acid lead arsenate. It is interesting to note that larvae in soil treated with acid lead arsenate did not lose weight as rapidly as those in soil treated with barium arsenate or calcium arsenate."